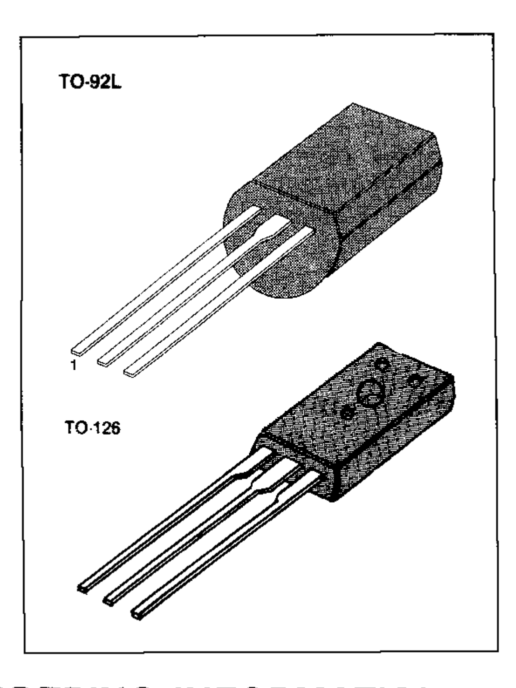
DC MOTOR SPEED CONTROLLER

The KA2404 is a monolithic integrated circuit designed for DC motor speed controllers.



FEATURES

- Suitable for DC motor speed controllers of cassette tape recorders and radio cassettes.
- Excellent stability of each characteristics against ambient temperature.
- High output current.
- Low quiescent current (1.3mA: typ).
- Low reference voltage.
- Wide operating supply voltage range (V_{CC} = 4V ~ 12V)
- KA2404A: To-126 PKG type

ORDERING INFORMATION

Device	Package	Operating Temperature
KA2404	TO-92L	−20°C ~ +70°C
KA2404A	TO-126	

EQUIVALENT CIRCUIT BLOCK DIAGRAM

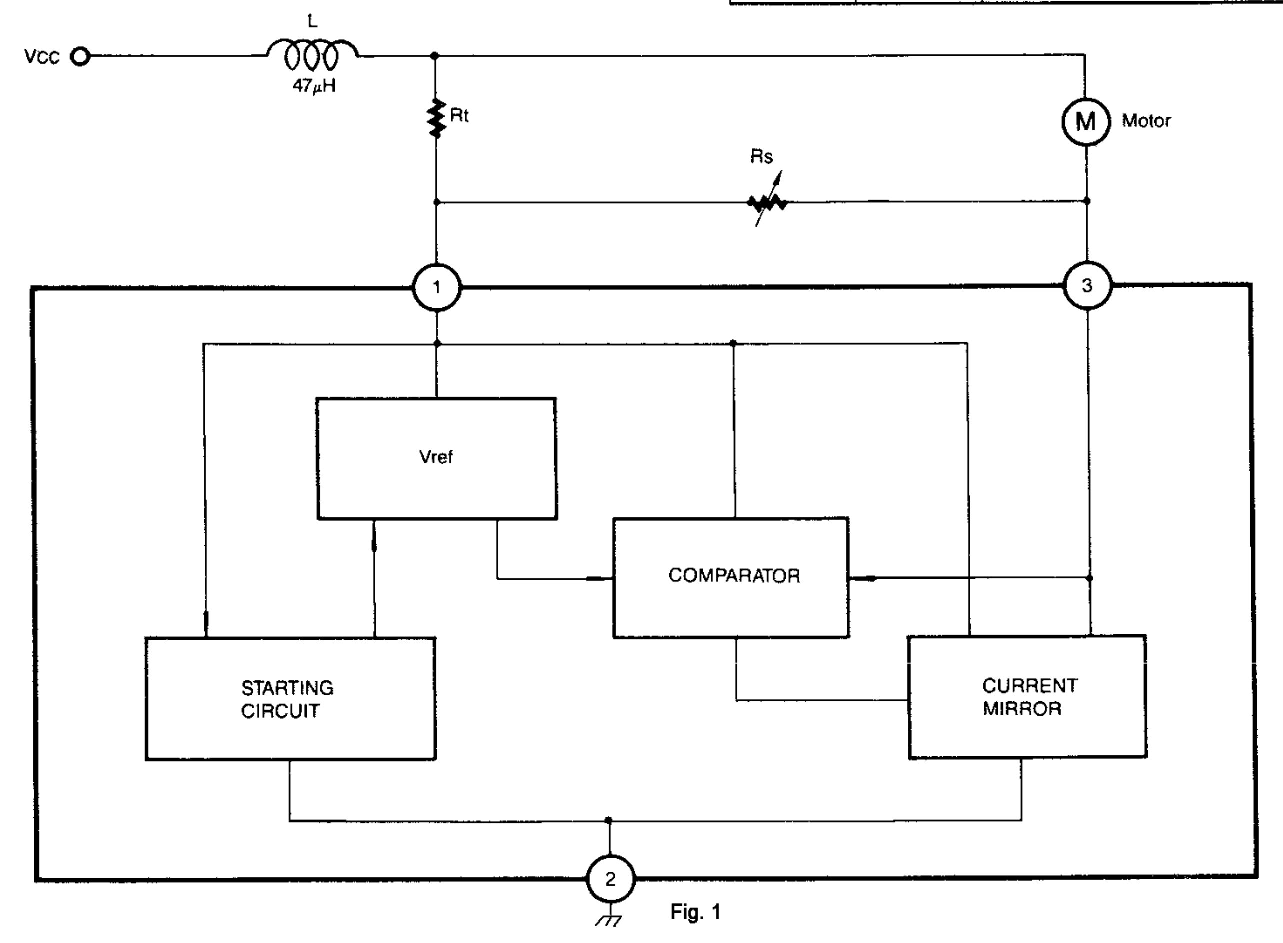


Fig. 1

ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Characteristics	Symbol	Value	Unit
Supply Voltage	V_{CC}	16	V
Circuit Current	I_3	2 (Note 1)	A
Power Dissipation	P_D (TO-92L)	800	mW
(TO-126)	1.3 (Note 2)	W	
Operating Temperature	T_{OPR}	−20 ~ +70	°C
Storage Temperature	T_{STG}	−40 ~ +125	°C

Note 1: 5>5 sec
Note 2: Ta=25°C, with a 100×100mm bakelite printed circuit board (35μ Cu leaf)

ELECTRICAL CHARACTERISTICS

(Ta=25°C, V_{CC}=9V, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	Fig
Reference Voltage	V_{REF}	I_3=10mA	1.10	1.27	1.40	V	2
Quiescent Circuit Current	I_{ccq}	Rm=180Ω	0.8	1.3	1.8	mA	4
Current Coefficient	K	Rm_1=44Ω Rm_2=33Ω	16	18	20		3
Voltage Characteristic of Current Coefficient	$\frac{\Delta K}{K}/\Delta V_{CC}$	I_3=100mA V_{CC}=4~12V		0.4		%/V	3
Voltage Characteristic of Reference Voltage	$\frac{\Delta V_{REF}}{V_{REF}}/\Delta V_{CC}$	I_3=100mA V_{CC}=4~12V		0.06		%/V	2
Current Characteristic of Current Coefficient	$\frac{\Delta K}{K}/\Delta I_3$	I_3=30~200mA		−0.02		%/mA	3
Current Characteristic of Reference Voltage	$\frac{\Delta V_{REF}}{V_{REF}}/\Delta I_3$	I_3=30~200mA		−0.02		%/mA	2
Temperature Characteristics of Current Coefficient	$\frac{\Delta K}{K}/\Delta T_a$	I_3=100mA T_a= −20~ +75°C		0.01		%/°C	3
Temperature Characteristics of Reference Voltage	$\frac{\Delta V_{REF}}{V_{REF}}/\Delta T_a$	I_3=100mA T_a= −20~ +75°C		0.01		%/°C	2

TEST CIRCUIT 1

Reference Voltage

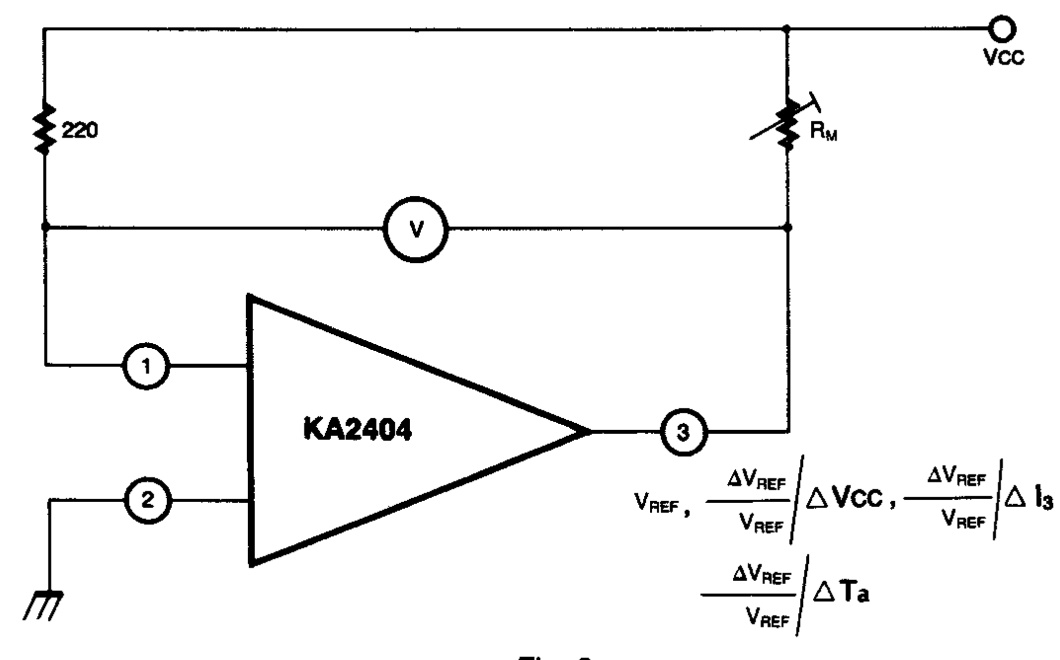


Fig. 2

TEST CIRCUIT 2

Current Coefficient

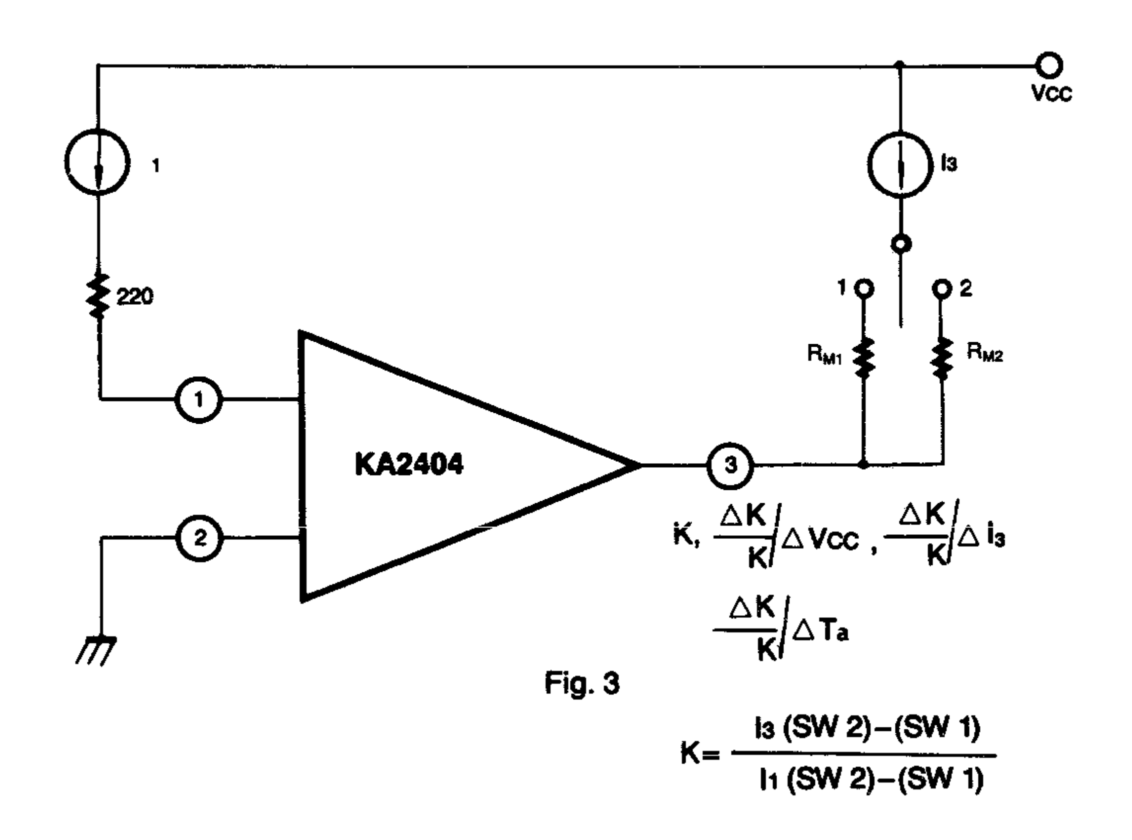


Fig. 3

$$K = \frac{I_3 \text{ (SW 2)} - \text{(SW 1)}}{I_1 \text{ (SW 2)} - \text{(SW 1)}}$$

TEST CIRCUIT 3

Quiescent Circuit Current

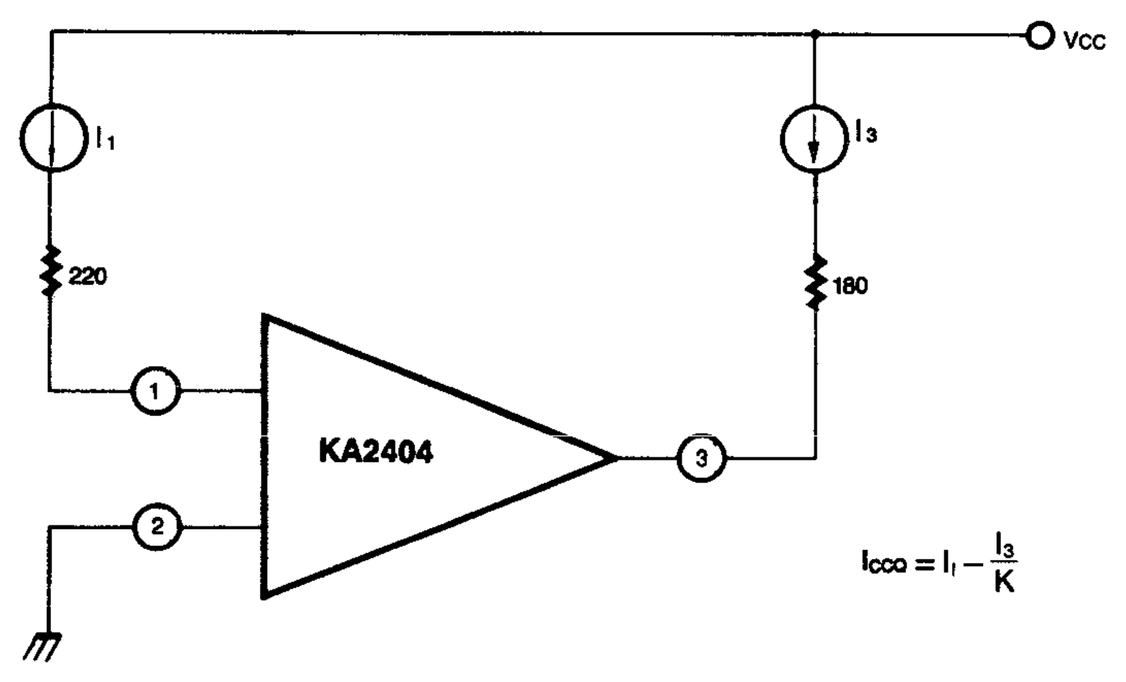
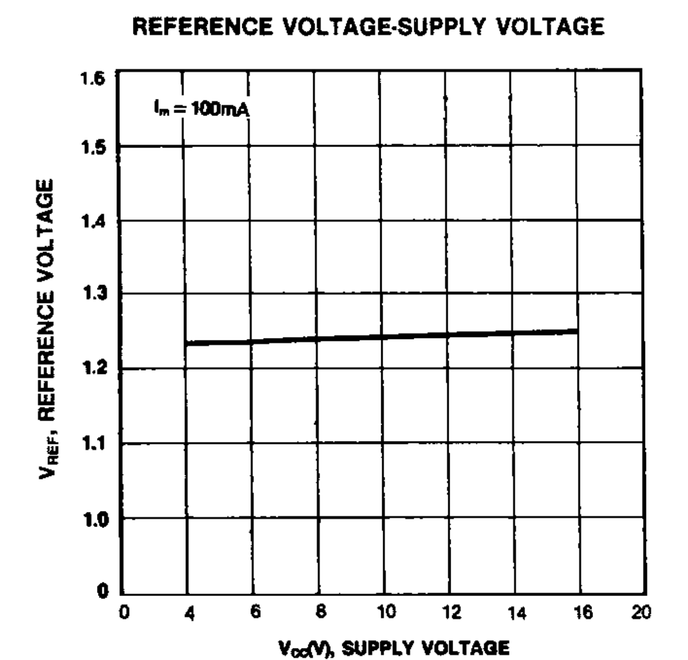
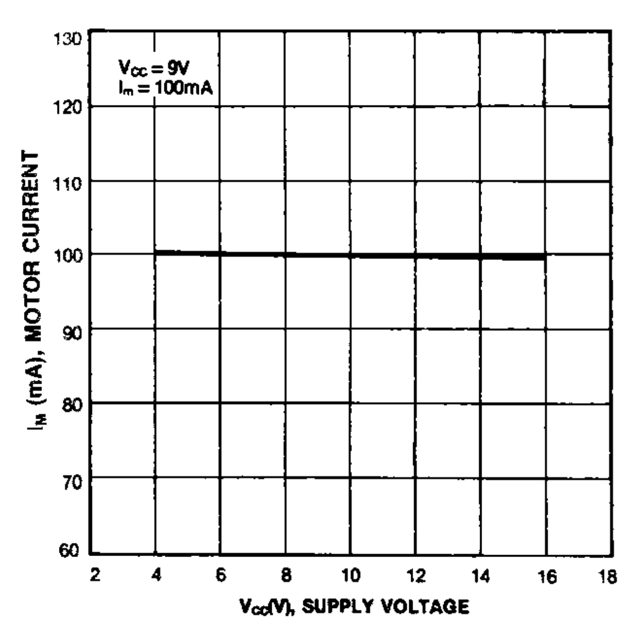
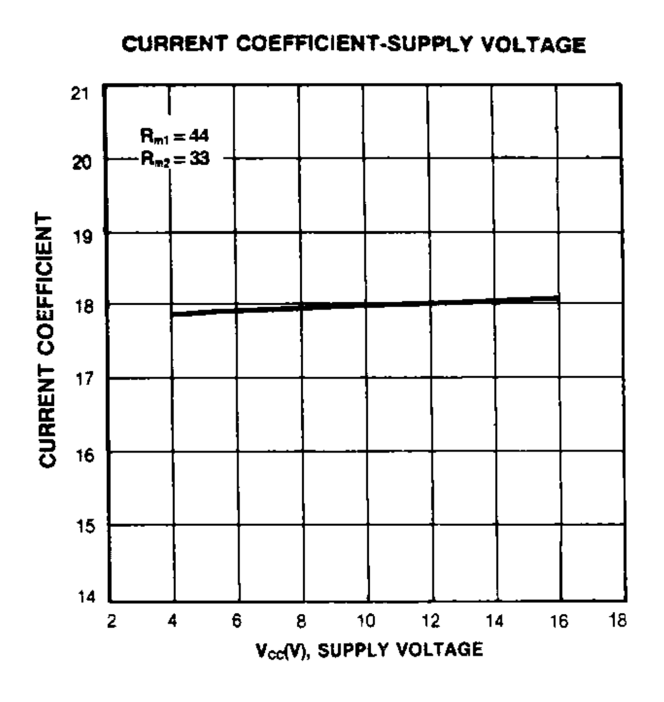
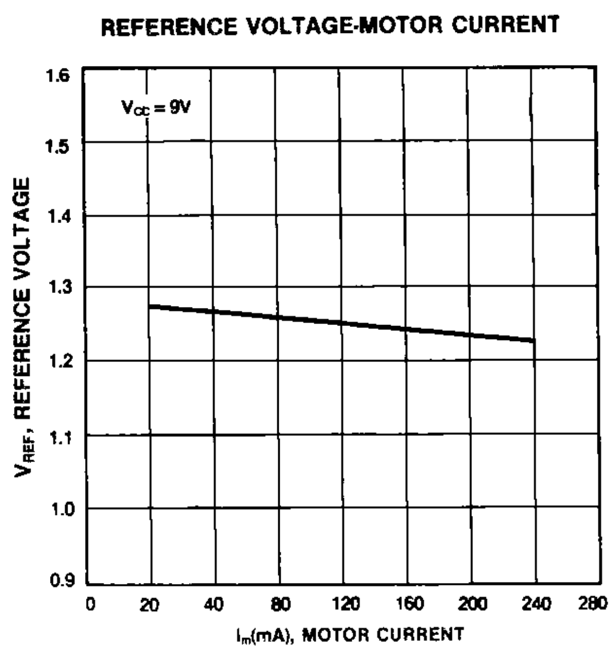


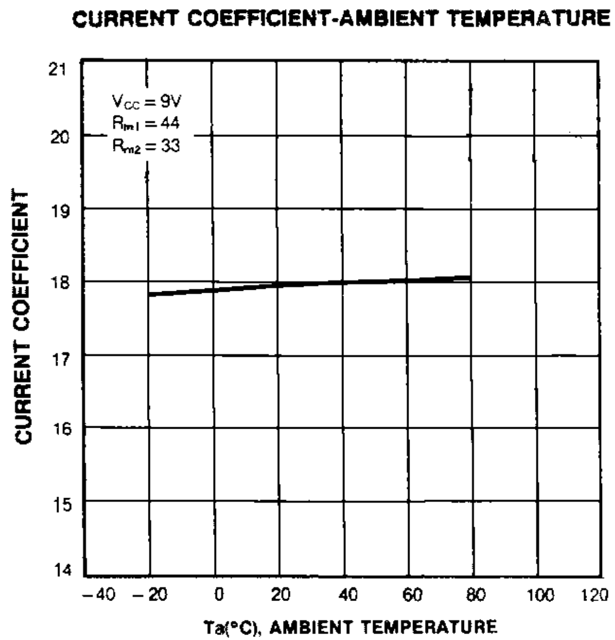
Fig. 4

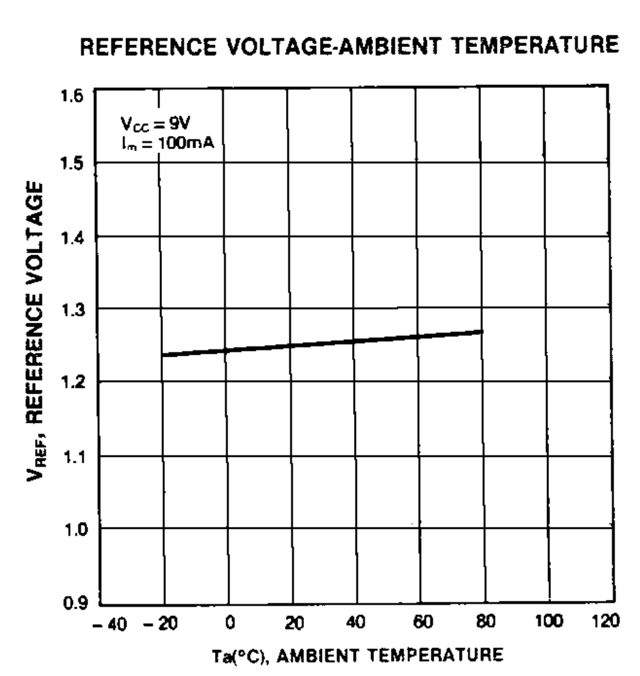

REFERENCE VOLTAGE-SUPPLY VOLTAGE
I_m = 100mA
V_{REF}, REFERENCE VOLTAGE
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0
0 4 6 8 10 12 14 16 20
V_{CC}(V), SUPPLY VOLTAGE


MOTOR CURRENT-SUPPLY VOLTAGE
V_{CC} = 9V
I_m = 100mA
I_M (mA), MOTOR CURRENT
130
120
110
100
90
80
70
60
2 4 6 8 10 12 14 16 18
V_{CC}(V), SUPPLY VOLTAGE

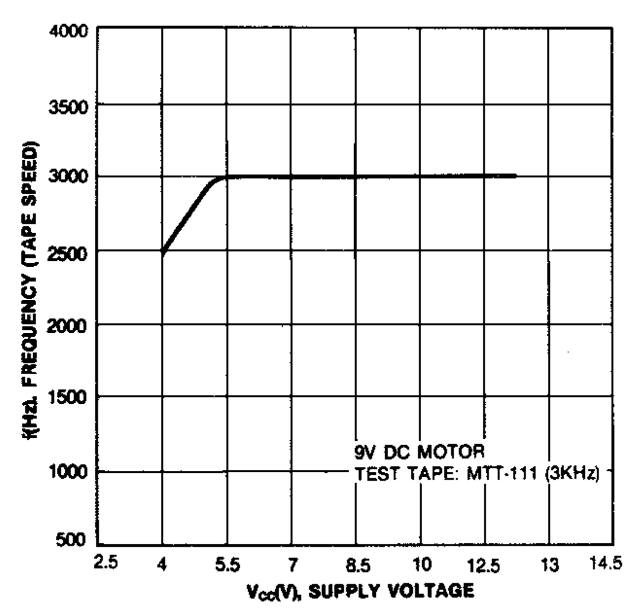

CURRENT COEFFICIENT-SUPPLY VOLTAGE
R_{m1} = 44
R_{m2} = 33
CURRENT COEFFICIENT
21
20
19
18
17
16
15
14
2 4 6 8 10 12 14 16 18
V_{CC}(V), SUPPLY VOLTAGE

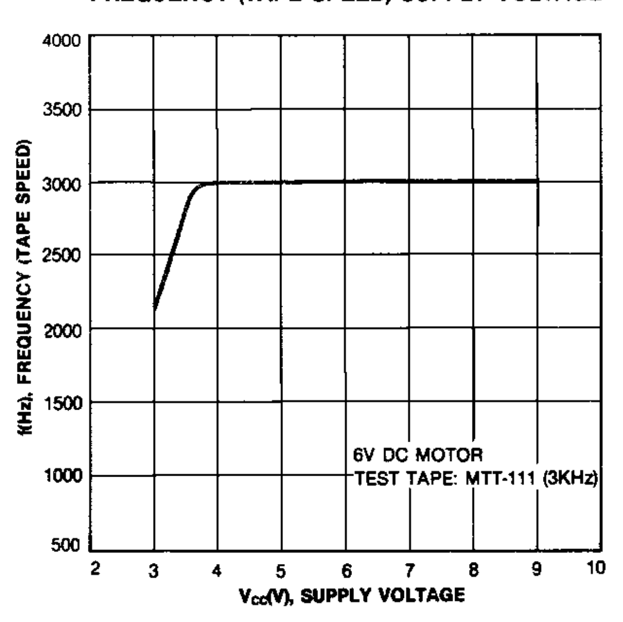

REFERENCE VOLTAGE-MOTOR CURRENT
V_{CC} = 9V
V_{REF}, REFERENCE VOLTAGE
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0 20 40 80 120 160 200 240 280
I_m(mA), MOTOR CURRENT


CURRENT COEFFICIENT-AMBIENT TEMPERATURE
V_{CC} = 9V
R_{m1} = 44
R_{m2} = 33
CURRENT COEFFICIENT
21
20
19
18
17
16
15
14
−40 −20 0 20 40 60 80 100 120
Ta(°C), AMBIENT TEMPERATURE


REFERENCE VOLTAGE-AMBIENT TEMPERATURE
V_{CC} = 9V
I_m = 100mA
V_{REF}, REFERENCE VOLTAGE
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
−40 −20 0 20 40 60 80 100 120
Ta(°C), AMBIENT TEMPERATURE

(APPLICATION CHARACTERISTICS)





APPLICATION CIRCUIT

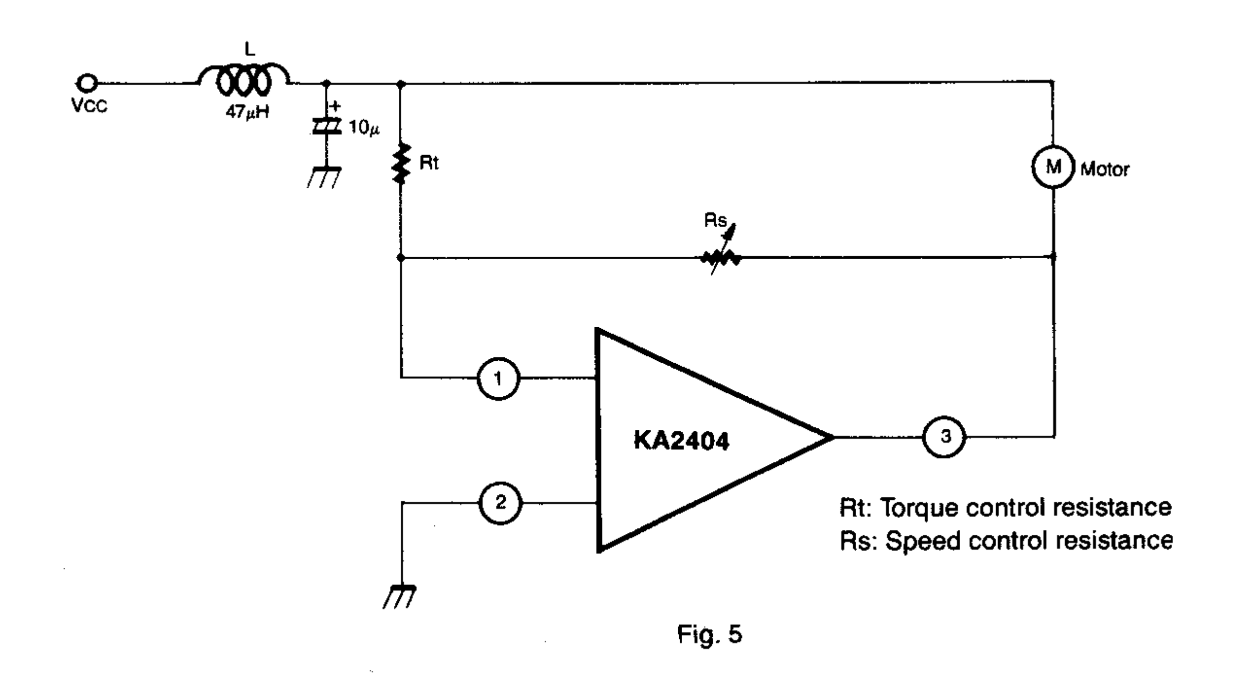


Fig. 5